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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/090,316	03/01/2002	Peter G. Borden	M-6099 US	5495

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EXAMINER

ROSENBERGER, RICHARD A

ART UNIT PAPER NUMBER

2877

DATE MAILED: 01/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/090,316

Applicant(s)

BORDEN ET AL.

Examiner

Richard A Rosenberger

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 06 November 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ 6) ☐ Other: \_\_\_\_\_

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1. Claims 8 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 8, "said second beam" has no antecedent basis or connection to the structure of claims 1 and 7, from which it depends.

In claim 11, "the second beam" has no antecedent basis.

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this

Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 19-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Rosencwaig et al (US 4,636,088).

The reference discloses a first source (30) of a first beam which is modulated at some frequency (by modulator 32) and heats a region of a structure being evaluated. There is a second source (50) of a second beam, and a photosensitive element (56) located in the path of the second beam after reflection from the region of the structure being evaluated.

The reference does not discuss frequency of modulation of the first beam in terms of the transfer of heat by diffusion. However, the reference does disclose that the frequency is low, disclosing that it is "preferably greater than 50 kHz". To understand the scope of the language of the claim it is appropriate to look to the supporting specification; the instant specification gives values of the frequency used in the invention as 0.1 kHz to 100 kHz (page 23, line 3). The teaching of the reference includes having the frequency as low as 50 kHz, and thus includes frequencies in the range of 50 kHz to 100kHz, which, according to the instant specification, meets the claimed condition. If a frequency of 50 kHz to 100 kHz meets the claimed condition for applicant, it will inherently meet it for the reference.

The reference discloses a processor (58) which does such operations and adding (column 8, lines 53-54) and comparing (claim 7 of the reference), and "may be programmed" (column 9, line 49-50); as these are computational steps, the processor is a computer. It compares (claim 7 of the reference) the beam to a known standard, which comparison includes determining if the reflected power is greater than some predetermined power from the standard.

5. Claims 1-18 and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rosencwaig et al (US 4,636,088).

Rosencwaig et al shows a method for determining a property of a portion of a structure having a first layer; see the discussion of layers in column 4, lines 50-61, column 6, lines 45, and elsewhere. The reference teaches generating a first beam (34) of electromagnetic radiation (column 6, lines 20-24), focusing the beam onto a region of a first layer (column 6, lines 32-33); as the beam is focused on the sample and the sample may include a top layer, it is necessarily true that the beam is focused onto a region of the first layer. The reference measures a temperature change in the surface of the sample (column 7, lines 3-5 and column 8, lines 1-4). The reference uses a relationship between temperature change and an electrical conductive property (dopant level; see column 10, lines 1-21). The use of this technique to measure any semiconductor material would have been obvious because it would have been expected that the properties of semiconductors that give rise to the measurement in the reference would be the same that would give rise to the same measurable effects in other semiconductors so long as the pump beam is sufficiently absorbed to give rise to the disclose heating and sufficiently reflective that the reflectance of the probe beam can be measured.

The reference does not discuss frequency of modulation of the first beam in terms of the transfer of heat by diffusion. However, the reference

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does disclose that the frequency is low, disclosing that it is “preferably greater than 50 kHz”. To understand the scope of the language of the claims it is appropriate to look to the supporting specification; the instant specification gives values of the frequency used in the invention as 0.1 kHz to 100 kHz (page 23, line 3). The teaching of the reference includes having the frequency as low as 50 kHz, and thus includes frequencies in the range of 50 kHz to 100kHz, which, according to the instant specification, meets the claimed condition. If a frequency of 50 kHz to 100 kHz meets the claimed condition for applicant, it will meet it for the reference.

The reference discusses moving the sample to measure different regions of the sample (see column 6, lines 8-12).

All layers are at least to some degree optically absorbing; and it is the absorption of the pump beam 34 that causes the heating of the sample in the reference.

The reference focuses (claim 5 of the reference) a beam (52) onto a layer being tested, and measured the reflectance of the beam from the sample. The sample may have a layer thereon; see above. The reflectance is correlated to a previously determined value from a previous reflectance measurement from a reference wafer (column 9, lines 49-55; claim 7 of the reference).

The sample is moved to make a plurality of measurements along a line (column 6, line 9; column 9, lines 62 and 64-65).

Using the measurements to control a manufacturing process would have been obvious; for example, measuring the dopant concentration (column 3, lines 34-40), discovering that it is incorrect, and not adjusting the process would be foolish.

The use of any known circuitry for detecting the modulated reflected beam, such as a well-known lock-in amplifier, would have been obvious because these are known arrangements for detecting such modulated signals.

The reference teaches using a dichroic mirror which will reflect the second beam but not the first (column 6, lines 35-38 and column 7, lines 24-28). The use of other known means to separate the reflected first and second beams, such as filters, would have been obvious because they are known means for accomplishing the purpose being pursued in the reference.

The reference teaches that the second beam be selected to not significantly heat the sample; choosing the second beam to provide less than 10% of the heating is within the general scope of the teachings of the reference, and would have been obvious.

It would have been obvious to use the method of the reference with any type of material used in the semiconductor manufacture to which the reference is in general directed; the reference does not teach or suggest any criticality in the type of material with which the method of the reference may be used.

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6. Claim 5 is further rejected under 35 U.S.C. 103(a) as being unpatentable over Rosencwaig et al (US 4,636,088) as applied to claim 2 above, and further in view of Rosencwaig (US 4,513,384).

At the bottom of column 5, a variation of the claimed formula is given, differing only by algebraic manipulation and the use of angular frequency  $\omega$  rather than frequency  $f$ . As the Rosencwaig et al ('088) reference teaches that the frequency of the modulation of the pump beam (34) be selected to produce modulation of the detected probe beam 52 (note column 4, lines 7-13; if the reflected beam were not modulated, then the "narrow bandpass filters" of line 10 would render the device inoperative), it is at least obvious that the frequency be selected so that this will happen, that the frequency not be so high that the periodic changes in the reflectivity not occur because the heat from the pump beam does not have time to diffuse away from the heated area between periods of high intensity. Thus any operative system must meet the claimed limitation, and, as the formula is known, those in the art would recognize that this is the case.

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory



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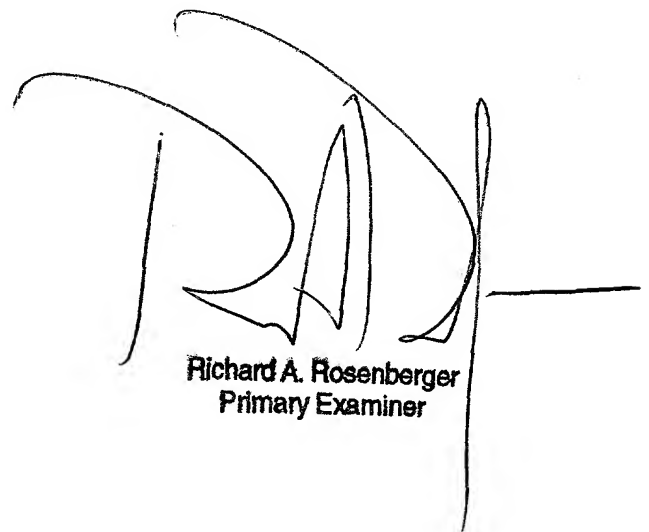
period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Papers related to this application may be submitted to Group 2800 by facsimile transmission. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The fax number is (703) 872-9306

Any inquiry concerning this communication or earlier communications from the examiner should be directed to R. A. Rosenberger whose telephone number is (571) 272-2428.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0956.

R. A. Rosenberger  
20 January 2004



Richard A. Rosenberger  
Primary Examiner